ACCESS MANAGEMENT GUIDELINES

TOWN OF SAHUARITA

January 2019

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1. EXECUTIVE SUMMARY

Access Management is a process that provides access to land development while simultaneously preserving the flow of traffic on the surrounding system in terms of safety, capacity, and speed. This document provides a policy for access management in the Town of Sahuarita. It is the responsibility of the Town Engineer to administer, coordinate and enforce the provisions and standards in this document.

The lack of a sound access management policy generally results in high crash rates, increased user delays, excessive emissions, and neighborhood cut-through traffic, among other things. By adopting this policy, it is the intent of the Town of Sahuarita to provide safe and efficient operations of all modes of traffic within the Town roadway system, and to maximize the service life of roadway investments by limiting or delaying the need for costly capital improvements. Specific benefits of effective access management policies are:

- Lower crash rates
- Reduction of collisions involving pedestrians or bicyclists
- Improved roadway efficiency
- Better accessibility to developments
- Elimination of cut-through traffic in residential areas
- Shorter traffic delays

The concept of functional classification is introduced in Chapter 3 of this document. The PAG Regionally Significant Corridors Study shows Nogales Highway, Pima Mine Road, Sahuarita Road, and El Toro Road in the Town as regionally significant corridors. Other major roadways in the Town include Old Nogales Highway, Duval Mine Road, La Cañada Drive, Abrego Drive, Campbell Avenue, Rancho Sahuarita Boulevard, and La Villita Road.

Chapter 4 discusses the benefits of access management for traffic safety and operations, for non-motorized users, and for business. Objectives of access management in the Town of Sahuarita and potential exceptions to the standards are presented in Chapter 5.

Access management standards are discussed in Chapter 6. The chapter defines spacing of access points and their impacts on the operational efficiency and safety performance of the roadway. Further, driveway density, driveway alignment, turn lane warrants, and considerations for non-motorized users are included in Chapter 6.

The last chapter of this document presents the requirements of the Town for Traffic Impact Analyses (TIA) and dedicated turning lanes. The Town adopts ADOT's policy, which requires a TIA for any development that generates 100 or more gross trips during the peak hour.

This policy becomes effective immediately. Please refer any suggestions or questions to the Town of Sahuarita Public Works department.

MJ Dillard, P.E. Town Engineer & Public Works Director	1-25-19 Date

2. INTRODUCTION

2.1. PURPOSE

This document provides a policy for access management in the Town of Sahuarita based on nationally recognized guidelines. A key reference source was the *Access Management Manual*[1], published by the Transportation Research Board (TRB) in 2014.

The Federal Highway Administration's official definition of access management is "the process that provides access to land development while simultaneously preserving the flow of traffic on the surrounding system in terms of safety, capacity, and speed." The purpose of managing roadway access is to improve safety, increase the efficiency of traffic operations, and to maximize the benefit-cost ratio of roadway improvements that are intended to provide high levels of mobility.

2.2. AUTHORITY

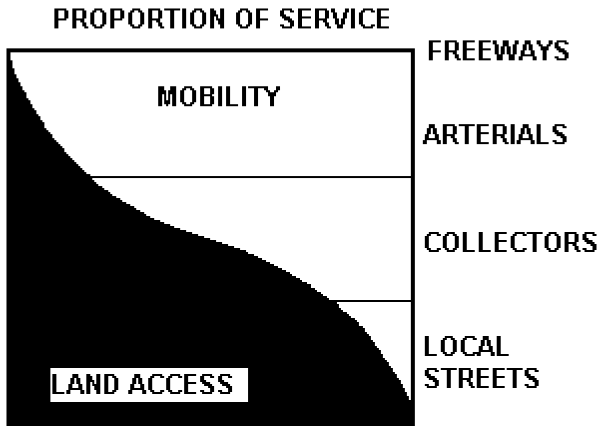
It is the responsibility of the Town Engineer to administer, coordinate and enforce the provisions and standards in this document, and to act and decide on all interpretations and requests for modifications.

The Town of Sahuarita understands that, in some cases, strict compliance with this policy may not be feasible. In those cases, the Town Engineer may grant a modification from these standards. The petitioner must be able to show, at the discretion of the Town Engineer, that the strict application of the provision(s) in question would create an extraordinary and unnecessary hardship, and that the change would not be in conflict with the principles of traffic safety and operational efficiency.

3. FUNCTIONAL CLASSIFICATION

Functional classification is the process by which streets and highways are grouped into classes, or systems, according to the character of service they are intended to provide. The major street functional categories are freeways, arterial, collectors, and local streets. Each of these categories have different characteristics in two areas: the amount of mobility they provide and how restrictive or permissive they are in terms of providing access to land, as shown in Exhibit 3-1.

Exhibit 3-1. Access - Mobility Relationship by Functional Class[2]



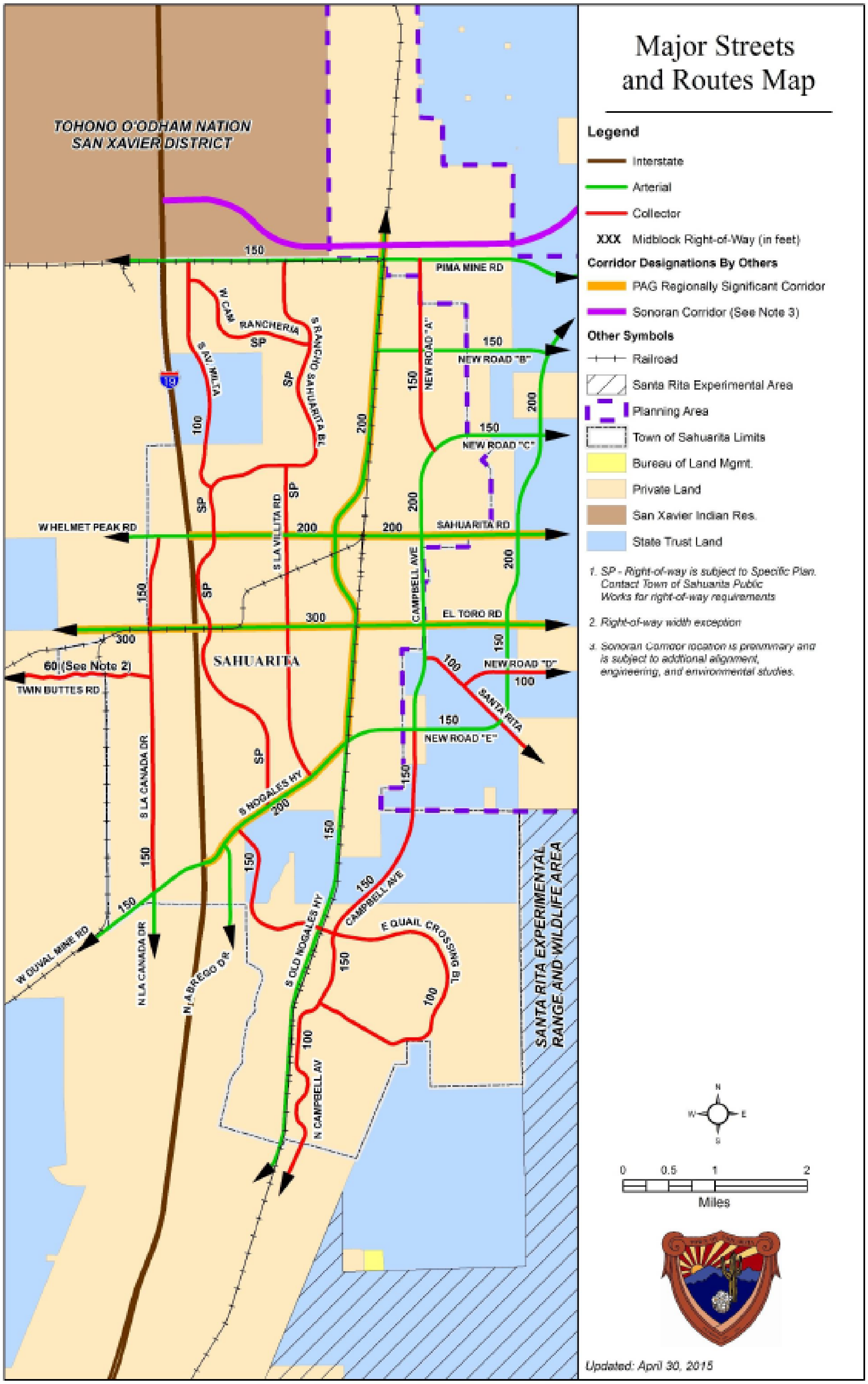
Freeways provide mobility for large traffic volumes at high speeds but have limited access points. Arterial streets also accommodate large traffic volumes but have more points of access than freeways. Collector roadways normally offer a balanced combination of mobility and access, while local streets emphasize the access to land but handle low traffic volumes.

This policy is concerned with arterial and collector roadways. Arterial roadways are designed for the safe and efficient movement of high volumes of people and goods at a reasonable level of service. Their major function is to provide mobility. Arterials can be further classified as principal arterials and minor arterials. Principal arterials primarily serve regional traffic movements. Minor arterials serve inter- and intra-city traffic movements.

Collector roadways gather traffic from local streets and funnel them to the arterial network. They constitute the routes with moderate speeds on which predominant travel distances are shorter than on arterial routes. Collectors can be further classified as major collectors and minor collectors. Typically, major collectors are longer in length, have lower connecting driveway densities, higher speed limits, are spaced at greater intervals, have higher annual average traffic volumes, and may have more travel lanes than minor collector roadways.

The requirements in this document apply to all roadways included in the Town of Sahuarita Major Routes and Streets (MS&R), as shown in Exhibit 3-2. In addition, all non-residential public streets in the Town of Sahuarita that are not included in the MS&R shall follow the requirements for low-speed collectors described in this document. Further, any access within ¼ mile of an ADOT traffic interchange or facility will require ADOT concurrence.

Exhibit 3-2. Town of Sahuarita Major Streets and Routes



4. BENEFITS OF ACCESS MANAGEMENT

There are several benefits associated with access management techniques, including improved movement of through traffic, reduced crashes, and fewer vehicle conflicts. The three key sets of techniques for a successful access management are:

- Access spacing, including spacing between signalized intersections, unsignalized intersections, and driveways
- Turning lanes, including dedicated left turn and right turn lanes, as well as indirect left turns and U-turns, and roundabouts
- Median treatments, including two-way left turn lanes and raised medians

4.1. BENEFITS OF ACCESS SPACING

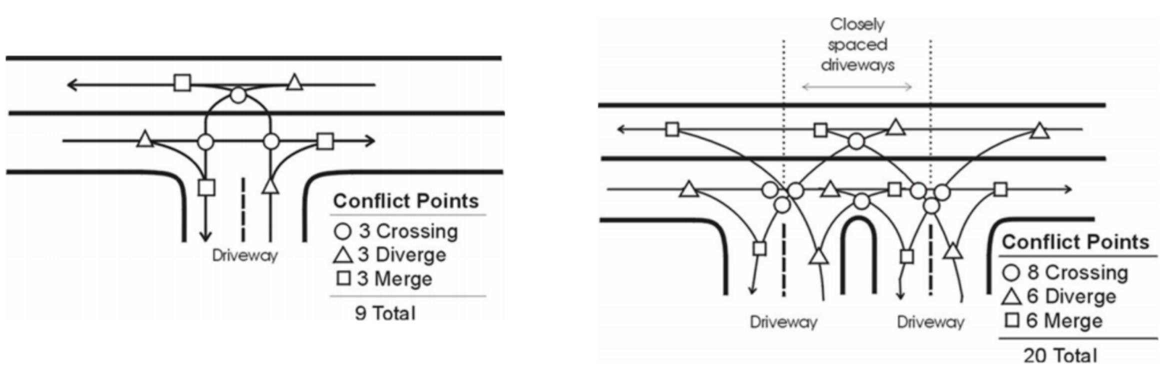
Proper access management increases safety due to the reduction of traffic conflicts, which occur where vehicle paths cross, merge, or weave. Traffic conflicts are affected by the location and spacing of intersections and driveways since the complexity of the driving task increases when those access connections are closely spaced.

Increasing the distance between signalized intersections improves traffic flow, reduces congestion, and reduces emissions. The appropriate spacing between signalized intersections is a function of the ability to progress two-way traffic along the mainline roadway. Overall, each additional signal over two signals per mile, which represents ½ mile between intersections, is expected to increase travel time by over six percent[1].

Closely spaced driveways require drivers to navigate complex traffic situations where other vehicles may be entering or exiting the roadway. Fewer driveways allow for orderly merging of traffic and present fewer challenges to drivers. Further, fewer access points represent fewer slow vehicles, which allows through traffic to maintain speeds closer to free flow speeds[1].

Safety conditions are also affected by driveway density. Exhibit 4-1 compares vehicular conflict points at a typical driveway versus the effect of closely-spaced driveways.

Exhibit 4-1. Conflict Points at Typical Driveway vs. Closely-Spaced Driveways[3]



The TRB *Access Management Manual*[1] documents that crash rates increase with an increase in access density. The manual suggests that an increase from 10 driveways to 20 driveways per mile would increase crash rates by approximately 30 percent.

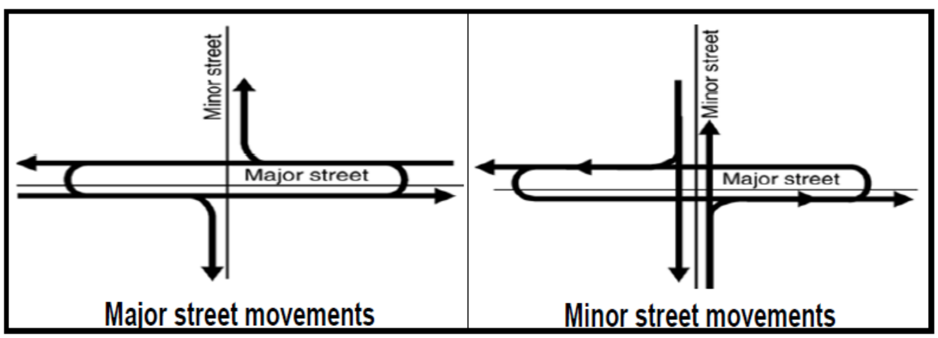
4.2. BENEFITS OF TURN LANES

Turn lanes at intersections and driveways can improve safety and capacity. If there are no exclusive turn lanes, turning vehicles slow down or come to a stop in a through lane while waiting for an acceptable gap, increasing delay for through vehicles. It is estimated that adding a left turn lane increases roadway capacity by approximately 25 percent[1].

The absence of turn lanes can also increase the risk of rear-end crashes when turning vehicles slow down, as well as left turn crashes when gaps in traffic are small. On average, adding a left turn lane results in a 25 to 50 percent crash reduction on four-lane roads, and up to a 75 percent reduction in crashes at unsignalized access locations. Overall, adding a right turn lane results in a 20 percent reduction of total crashes[1].

Several jurisdictions have adopted the indirect left turn treatment to reduce conflicts at intersections. This access management strategy involves the elimination of direct left turns at signal-controlled intersections from major and/or minor approaches. Research shows that the indirect left turn treatment reduces crashes by 20 percent on average compared to standard signalized intersections and by 35 percent if the indirect left turn is signalized. Capacity of the intersection also typically increases by 15 to 20 percent[4]. Exhibit 4-2 illustrates the movements at intersections with indirect left turn treatment.

Exhibit 4-2. Indirect Left Turn: Intersection Movements[4]

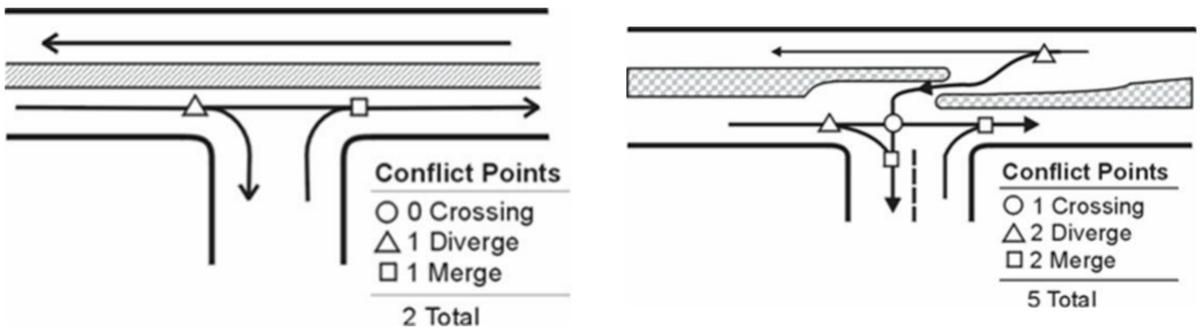


4.3. BENEFITS OF MEDIAN TREATMENTS

Median treatments are often used to manage or limit movements to and from driveways on roadway segments. There are two types of median treatments: non-traversable medians and continuous two-way left turn lanes (TWLTL). Non-traversable medians separate opposing directions of travel and limit where left turn and crossing movements can occur, reducing the risk of head-on, angle, and left turn crashes. Non-traversable medians result in an overall crash reduction of 55 percent or more when compared to undivided roadways[1]. Non-traversable medians can have openings to provide full or directional access to driveways. Exhibit 4-3 shows the conflict points when the non-traversable median is closed compared to a directional median opening.

Two-Way Left Turn Lanes (TWLTLs) provide for left turns in both directions of travel, reducing the risk of rear-end crashes that typically occur when turning vehicles slow down to wait for a gap in traffic. There is an approximate crash reduction of 33 percent when TWLTLs are used in comparison to undivided roadways[5].

Exhibit 4-3. Conflict Points with Non-Traversable Median: Full Closure vs. Directional Opening



In addition to safety benefits, a 30 percent decrease in delay and a 30 percent increase in capacity (relative to an undivided roadway) can result from the addition of either a non-traversable median or a two-way left turn lane[1].

4.4. BENEFITS FOR NON-MOTORIZED USERS

Access management strategies should encourage a built environment that supports bicycle, pedestrian, and transit mobility. Examples of land-planning actions for access management are:

1. Encourage multiuse activity centers rather than single-use developments
2. Establish minimum densities and infill incentives in designated activity centers and along express transit corridors
3. Orient urban development along streets

In addition to the benefits discussed in the previous sections, access management techniques provide a convenient and safe environment for non-motorized users. Examples of benefits of access management for pedestrians and bicyclists include:

- Access management identifies and connects missing links within the multimodal transportation network
- Raised medians offer safe midblock crossings for pedestrians and bicyclists
- Designing turn lanes at intersections of major roadways with pedestrian crossing islands increases pedestrian safety

When crossing the street, pedestrians must estimate vehicle speeds, adjust their walking speeds, determine adequacy of gaps, predict vehicle paths, and time their crossings appropriately. At night, this task is even more complex for both pedestrians and drivers. Raised medians and pedestrian crossing islands allow pedestrians to cross one direction at a time and provide a space to install improved lighting. Research indicates a 46 percent reduction in crashes involving pedestrians when non-traversable medians or pedestrian refuge areas are provided at marked crosswalk locations[1]. Improved lighting has been shown to reduce nighttime pedestrian fatalities at crossings by 78 percent[6].

Transit systems also benefit from access management techniques. With the reduction in delay and improved traffic flow, there is a reduction in in-bus time for transit users, improved utilization of the bus fleet, and reduced fuel consumption, emissions, and maintenance costs.

4.5. BENEFITS FOR BUSINESS

Access management strategies, especially median treatments, are usually a reason of concern for the business community. Two-way left turn lanes are not as controversial as non-traversable medians because they are not as restrictive. Business owners tend to associate the installation of raised medians with a negative impact on their customers, sales, and property values. However, studies found that left turns into and out of a development are very low during peak periods, mainly due to the difficulty in turning when through traffic volumes in the opposing lane are high.

Managing access can result in better traffic flow, fewer crashes, and a better shopping experience. A survey of merchants showed that 68 percent of the respondents reported little or no economic impact to their business after non-traversable medians with no openings at their driveway were implemented. In another study, 53 percent of the business proprietors who responded reported that sales were the same and 33 percent of the respondents reported that sales increased after access management techniques were added to the roadway[7].

Overall, access management reduces roadway delays, improves traffic flow, and increases safety conditions. These benefits typically preserve and possibly enhance the market reach of business in the corridor. In addition, delays along a corridor with poor access management can increase shipping and distribution cost for businesses along the corridor. Business deliveries and distribution routes that have high crash frequency can also result in insurance companies increasing their premiums.

5. ACCESS MANAGEMENT IN THE TOWN OF SAHUARITA

This chapter describes the main objectives of implementing access management techniques in the Town of Sahuarita. The standards presented in this document are required for all roadways included in the Town of Sahuarita Major Routes and Streets (MS&R) and for all non-residential public streets in the Town. Exceptions to the requirements are only possible as described in section 5.2 in this chapter.

5.1. OBJECTIVES OF ACCESS MANAGEMENT

By implementing this policy, it is the goal of the Town of Sahuarita to provide safe and efficient operation of the roadway network while providing sufficient access to land development within the town. The specific objectives of this policy are to:

1. **Provide a specialized roadway system:** Different types of roadways serve different functions. It is important to design and manage roadways according to the primary function that they are expected to serve.

2. **Limit direct access to major roadways**: Arterial roadways that serve high volumes of through traffic need more access control to preserve their traffic function.

3. **Promote intersection hierarchy**: An efficient transportation network provides appropriate transition from one roadway classification to another.

4. **Locate signals to favor through movements:** Long, uniform spacing of intersections and signals on major roadways enhances the ability to coordinate signals and ensure continuous movement of traffic at the desired speed.

5. **Preserve the functional area of intersections and interchanges:** The functional area of an intersection or interchange is the area that is critical to its operation. Access connections too close to intersections or interchange ramps can cause significant traffic conflicts that impair the function of the affected facilities.

6. **Limit the number of conflict points at driveways and intersections:** Traffic conflicts occur when the paths of vehicles intersect and may involve merging, diverging, weaving, crossing, and stopping. Reducing the number of traffic conflicts improves traffic operations and results in fewer collisions.

7. **Separate conflict areas:** Intersections and driveways represent conflict areas. Drivers need sufficient time to address one potential set of conflicts before facing another. Separating conflict areas helps simplify the driving task and contributes to improved vehicle safety.

8. **Remove turning vehicles from through traffic lanes:** Turn lanes allow drivers to decelerate gradually out of the through lane and wait in a protected area for an opportunity to complete a turn, thereby reducing the severity and duration of conflicts between turning vehicles and through traffic. Turn lanes also improve the safety and efficiency of roadway intersections.

9. **Non-traversable medians to manage left turn movements:** Medians channel turning movements on major roadways to designated locations.

10. **Provide a supporting street and circulation system:** Well-planned communities provide a supporting network of local and collector streets (to accommodate development) as well as unified property access and circulation systems. Interconnected streets and circulation systems provide alternative routes for bicyclists, pedestrians, and drivers alike.

5.2. EXCEPTIONS TO ACCESS MANAGEMENT STANDARDS

Exceptions to the access management standards in this manual will only be granted on new and existing facilities if approved by the Town Engineer.

6. ACCESS MANAGEMENT STANDARDS

Access spacing is an important aspect of access management. Spacing standards vary by roadway category, with the higher through traffic category of roadways (i.e. arterials) being more restrictive. Spacing standards should be established for major signalized and unsignalized intersections as well as median openings and driveways. Spacing standards should apply to new land developments and to significant changes in the nature and size of existing developments.

The absence of turn lanes at major intersections, median openings, and driveways can reduce roadway capacity. When designing driveways, it is also important to follow access management standards for corner clearance, density, and alignment. Finally, non-motorized users shall be considered when implementing access management techniques.

This section includes the minimum spacing for each access type required by the Town of Sahuarita, driveway design requirements, turn lane warrants, and a discussion on non-motorized users' criteria. These requirements apply to access from any roadway on the Town Major Streets and Routes plan and for any non-residential access on any public street. If non-residential access is from a roadway not included in the MS&R plan, the low-speed collector guidelines should be applied. Any exceptions to these standards shall be approved by the Town Engineer.

6.1. INTERSECTION SPACING

Closely spaced or inconsistently spaced traffic signals on major roadways can significantly impair traffic progression, resulting in frequent stops, unnecessary delays, increased fuel consumption, excessive vehicle emissions, and high crash rates. Spacing major roads at consistent intervals facilitates operations by maximizing traffic flow and minimizing delay.

Closely-spaced unsignalized intersections, especially with no turn lanes, adversely impact traffic operations by creating side friction from turning vehicles, primarily in the outside traffic lane. This friction reduces the capacity of the roadway, since through traffic is slowed and may avoid that lane. Frequent unsignalized intersections increase weaving and merging activities, which introduces increased potential for vehicular crashes.

To provide safe and efficient traffic flow at major roadways, the minimum spacing for signalized and unsignalized intersections are shown in Exhibit 6-1 for each roadway class.

Exhibit 6-1. Minimum Spacing for Major Signalized and Unsignalized Intersections

Roadway Class	Minimum Spacing (ft)
Arterial Roads	1,320
High-Speed Collector (≥ 40 MPH)	660
Low-Speed Collector (≤ 35 MPH)	660

6.2. MEDIAN OPENING SPACING

When non-traversable medians are used as an access management technique, median openings are required to allow for property access and/or U-turns. Similar to intersections, minimum spacing requirements are important to avoid excessive conflict points. Exhibit 6-2 shows the minimum median opening spacing required in the Town of Sahuarita for each roadway class.

Exhibit 6-2. Minimum Median Opening Spacing

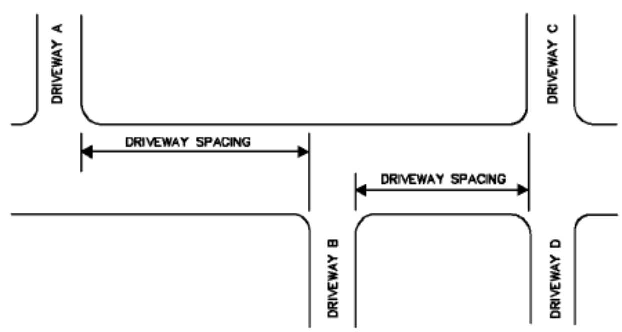
Roadway Class	Full Access (ft)	Directional Access (ft)
Arterial Roads	660	500
High-Speed Collector (≥ 40 MPH)	660	500
Low-Speed Collector (≤ 35 MPH)	400	330

6.3. DRIVEWAY SPACING

To ensure the distance between driveways is enough to avoid excessive conflict points, it is important that minimum driveway spacing requirements are met. In certain areas, such as rural areas, or when warranted by field conditions such as significant weaving or insufficient left turn queue storage during the peak period, increased driveway spacing may be required. This manual adopts minimum driveway spacing as shown in Exhibit 6-3.

Exhibit 6-3. Minimum Driveway Spacing

Roadway Class	Minimum Spacing (ft)
Arterial Roads	330
High-Speed Collector (≥ 40 MPH)	330
Low-Speed Collector (≤ 35 MPH)	200

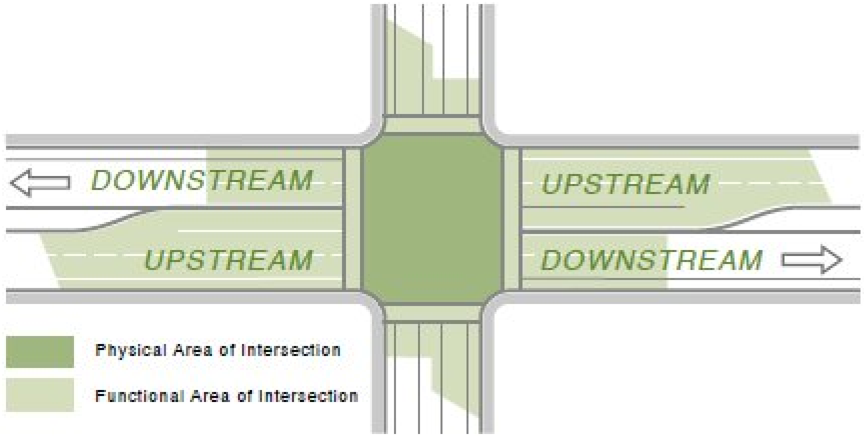


6.4. DRIVEWAY CORNER CLEARANCE

When parcel boundaries require driveways to be located near intersection corners, a minimum distance between the driveway and the nearest intersection should be defined. This distance, known as corner clearance, provides drivers with adequate perception-reaction time to assess potential downstream conflicts as well as prevents the location of driveways within the functional area of an intersection.

Driveways near signalized intersections must not be located within the functional area of the intersection unless approved by the Town Engineer. The functional limits are defined as the area between the near curb line of the cross street and the beginning of tapers for right turn and left turn lanes. Exhibit 6-4 illustrates functional and physical areas of an intersection.

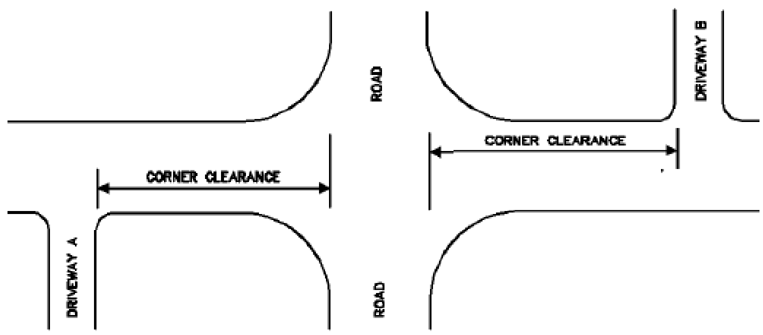
Exhibit 6-4. Functional and Physical Areas of an Intersection[5]



For driveways near unsignalized intersections, the minimum corner clearance, measured from nearest driveway edge to nearest crossing road edge, follows the *Pima County Subdivision and Development Street Standards*[8] and are shown in Exhibit 6-5. Note that the corner clearance only depends on the speed limit and is not dependent on the roadway classification.

Exhibit 6-5. Minimum Corner Clearance

Speed Limit (MPH)	Minimum Corner Clearance (ft)
≤35 MPH	150
40 MPH	185
45 MPH	230
50 MPH	275



6.5. DRIVEWAY DENSITY

The *Sahuarita Town Code*[9] establishes that multiple access points from major streets should be minimized to maintain safe traffic flow. Entries should be located as far as possible from street intersections. Retail complex entries should be consolidated to eliminate excess curb cuts. Large-scale commercial retail development shall have direct site access to an arterial road or collector road with not less than four lanes (two travel lanes in each direction), and no access shall be permitted from a local street.

Owners of large parcels typically have the desire to have multiple driveways that provide access to the roadways. However, closely-spaced driveways adversely impact road safety and operations. Driveways must respect all spacing requirements; however, no development shall have more than two driveways per ¼ mile of road frontage.

6.6. DRIVEWAY ALIGNMENT

Intersections and driveways must connect with a skew of 10 degrees or less unless a valid engineering reason can be given for deviations. The minimum tangent adjacent to the intersection should extend for at least 100 feet beyond the edge of the intersection.

6.7. TURN LANE WARRANTS

Dedicated turn lanes may be necessary from a safety and/or operational standpoint at locations where speeds or traffic volumes are high or if there are substantial turning volumes. Turn lanes expedite the movement of through traffic, increase intersection capacity, and promote the safety of all traffic. Turn lanes remove the speed differences in the main travel lanes, thereby reducing the frequency and severity of rear-end collisions. They also increase capacity of signalized intersections and may allow more efficient traffic signal phasing. In general, turn lanes should be considered at all reasonable and feasible locations. A condition where a turn lane may not be applicable is if the addition of a turn lane results in three or more lanes on an approach that is controlled by a stop sign at a major street.

Exhibit 6-6 presents the guidelines adopted by the Town of Sahuarita to determine the need for an exclusive left turn lane. Combinations of volumes and posted speeds that fall above the applicable line require a dedicated left turn lane. Combinations that fall below the applicable line may require a left turn lane depending upon the circumstances of the site, the variance of the speed, and the predictability of the future traffic.

Exhibits 6-7 and 6-8 present the guidelines adopted by the Town of Sahuarita to determine the need for an exclusive right turn lane on two-lane roadways and four-lane roadways, respectively. Combinations of volumes and posted speeds that fall above the applicable line require a dedicated right turn lane. Combinations that fall below the applicable line may require a right turn lane depending upon the circumstances of the site, the variance of the speed and the predictability of the future traffic.

Exhibit 6-6. Left Turn Lane Warrant[10]

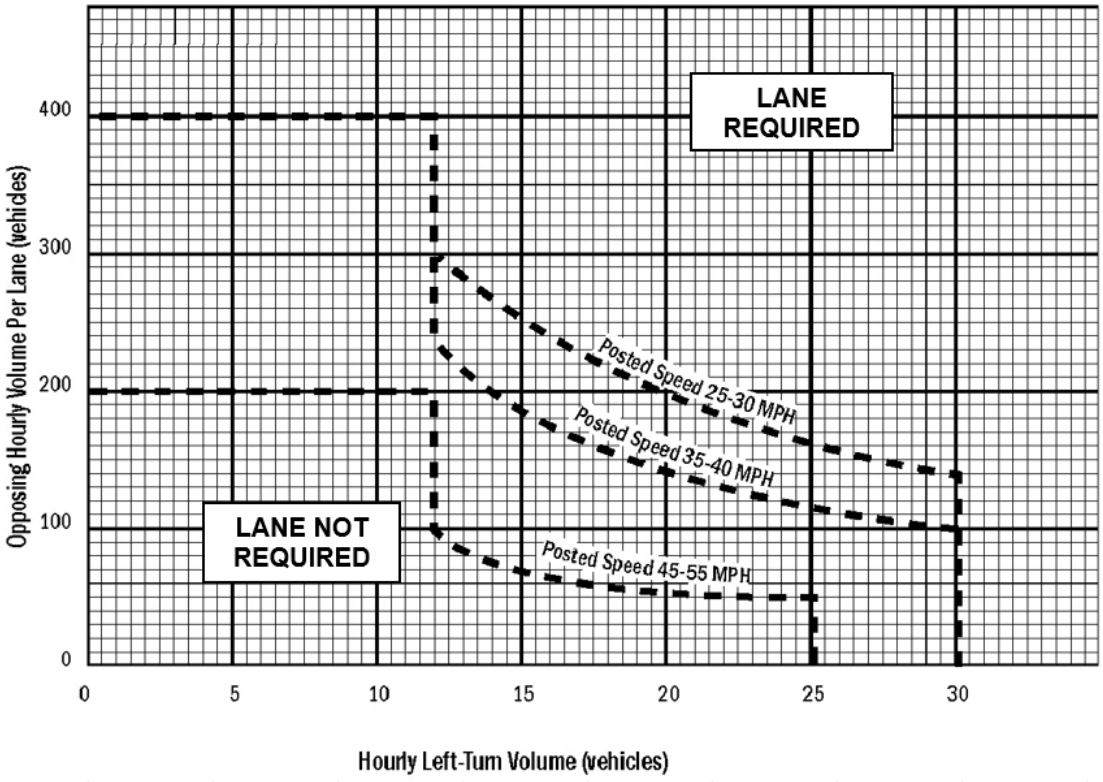


Exhibit 6-7. Right Turn Lane Warrant: Two-Lane Roadway[11]

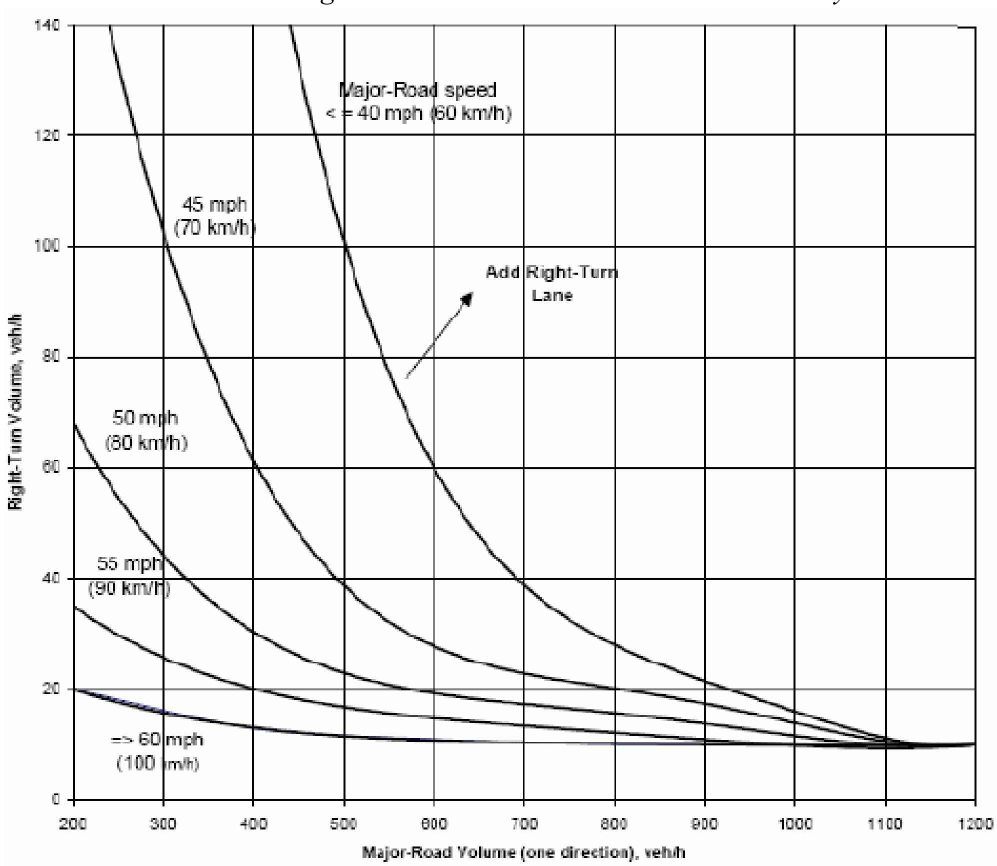
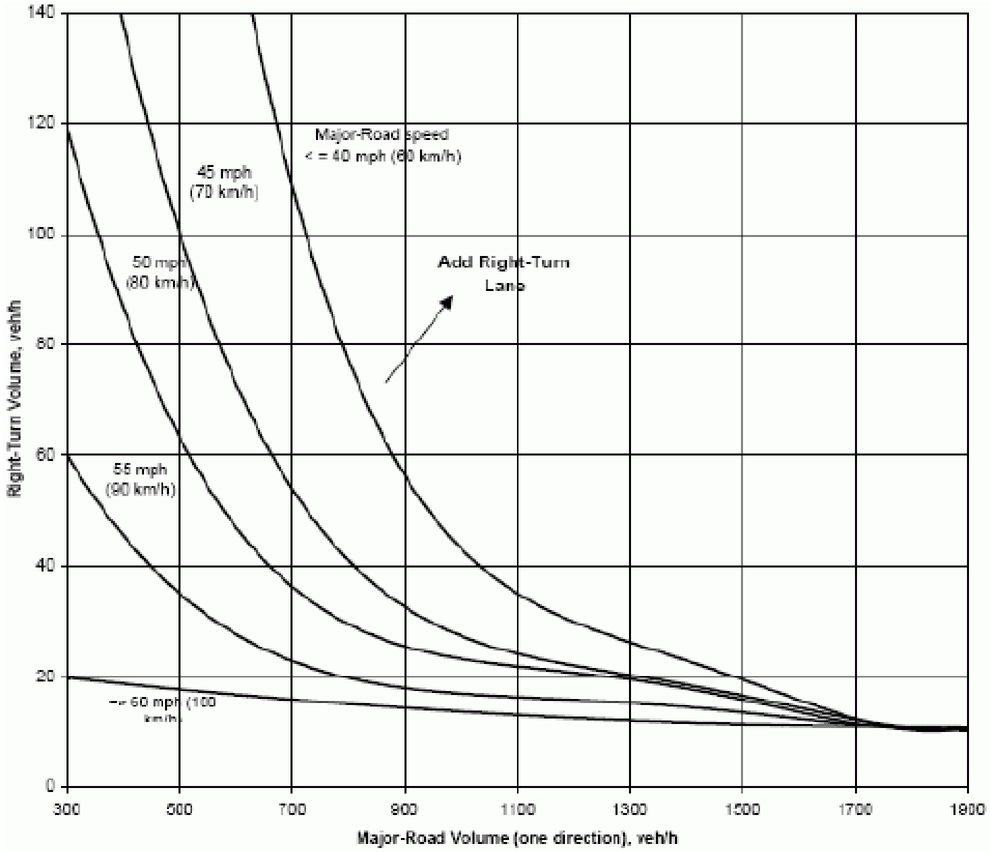


Exhibit 6-8. Right Turn Lane Warrant: Four-Lane Warrant[12]



6.8. NON-MOTORIZED USERS

If there are sidewalks and bicycle paths crossing a connection, the width, throat, radius, and pavement type at the access point should consider the interaction with non-motorized users. Some considerations on access management to include non-motorized users are:

- **Driveway width**: Excessively wide driveways provide an unprotected non-motorized environment that lacks clear definition for turning movements and increases the amount of time a pedestrian or bicyclist is exposed to traffic.

- **Sidewalk and pathway crossing alignment**: Non-motorized user crossings should be aligned in a way that the crossing path is in front of where vehicles stop. This would discourage vehicles to pull ahead in front of the crossing, increasing safety of non-motorized users.

- **Connectivity**: Connectivity of off-street non-motorized facilities at key locations will keep pedestrians out of the travel lanes and intersections.

- **Pedestrian and bicyclist visibility and interaction with vehicles**: Access management should increase non-motorized user visibility on the road as well as reduce interaction with vehicles. Dedicated bike lanes, road diets, center turn lanes, and parallel parking are effective ways of achieving those goals.

- **Mid-block crossings**: Where there is a significant distance between signalized intersections, additional mid-block crossings should be considered to provide safe, visible crossings for non-motorized users while also calming traffic. HAWK signals should be considered in addition to crosswalk markings where appropriate.

6.9. ADDITIONAL CONSIDERATIONS

Additional considerations for access management standards include:

- Assume a future traffic signal at all intersections of two roadways shown on the Town of Sahuarita Major Streets and Routes map.

- Where signalization is imminent or likely, the signal spacing guidelines should govern activity.

- No median openings must be placed within 660 feet of a signal.

- There should be no direct residential lot access to arterial or collector roadways.

- The spacing of right turn access on each side of a divided roadway can be treated separately. However, where left turns at median breaks are involved, the access on both sides should line up or be offset from the median break by at least 200 feet.

- On undivided roadways, access on both sides of the road should be aligned. Where this is not possible, driveways should be offset by at least 150 feet when two minor traffic generators are involved, and 300 feet when two major traffic generators are involved. Generators with average daily traffic equal or greater than 500 vehicles per day are considered major generators.

- Driveways for future use can be preapproved but can only be constructed if development is expected within six months. If development construction does not occur with one year, driveway must be removed at developer's expense.

- If driveway restriping is needed, including turn lanes, it is the responsibility of the developer.

7. TRAFFIC IMPACT STUDIES

To maintain safe and efficient operations throughout the Town of Sahuarita roadway network, it is necessary to evaluate the impact of all traffic generated by new developments. Such impacts shall be established by following section 240 (Traffic Impact Analysis) of the *Traffic Engineering Policies, Guides and Procedures (PGP)* of the Arizona Department of Transportation (ADOT)[13]. For applicability to the Town of Sahuarita, the title "Regional Traffic Engineer" shall be replaced by "Town Engineer" throughout the document. Section 240 of ADOT's Traffic Engineering PGP is included in Appendix A for reference.

There are two types of traffic analyses required by the Town of Sahuarita:

- Traffic Impact Analysis (TIA): a traffic engineering study which determines the potential traffic impacts of a proposed traffic generator. A complete analysis includes an estimation of future traffic with and without the proposed generator, analysis of the traffic impacts, and recommended roadway changes which may be necessary to accommodate the expected traffic. A TIA is required for any subdivision or development expected to generate 100 or more gross trips during the morning or afternoon peak hour of the generator.

- Traffic Statement (TS): an abbreviated traffic engineering study which determines the potential traffic impacts of a proposed traffic generator. A TS is similar to a Traffic Impact Analysis (TIA), but it is typically limited to site driveway concerns. A TS is required for any subdivision or development expected to generate fewer than 100 gross trips during the morning or afternoon peak hour of the generator.

Both a TIA and a TS shall be prepared by a registered Professional Engineer. For a TIA, the size of the study area and the study horizon shall be determined using the criteria presented in Exhibit 7-1. The number of trips generated shall be calculated using the latest edition of the *Trip Generation Manual*[14] from the Institute of Transportation Engineers.

Traffic Impact Analyses and Traffic Statements must be updated when the proposed development assumptions change. TIAs shall be updated if there are changes in land use, if trip generation differs from the original assumptions by 15% (either more or fewer trips), if trip distribution assumptions change, or if there are changes to the road network. An updated TIA is required in all cases previously mentioned unless waived by the Town Engineer.

Exhibit 7-1. Study Area and Study Horizon for Traffic Impact Analyses

Study Category	Development/Subdivision Characteristics	Study Horizons	Minimum Study Area
I	Small, 100-499	1. Opening year 2. 3 years after opening	1. Site access driveways 2. Adjacent signalized intersections and/or major unsignalized intersections within a minimum of ½ mile
II a	Moderate, single phase 500-1000	1. Opening year 2. 5 years after opening	1. Site access driveways 2. All arterials, signalized intersections, and/or major unsignalized intersections within a minimum of 1 mile
II b	Large, single phase >1000	1. Opening year 2. 5 years after opening 3. 10 years after opening	1. Site access driveways 2. All arterials, signalized intersections, and/or major unsignalized intersections within a minimum of 1 mile
II c	Moderate or large, multi-phase	1. Opening year of each phase 2. 5 years after opening of final phase for developments with < 1000 peak hour trips 3. 10 years after opening of final phase for developments with > 1000 peak hour trips	1. Site access driveways 2. All arterials, signalized intersections, and major unsignalized intersections within a minimum of 1 mile

8. REFERENCES

[1] *Access Management Manual: Second Edition*. Transportation Research Board, 2014

[2] *A Policy on Geometric Design of Highways and Streets*. American Association of State Highway and Transportation Officials, 2001.

[3] *Access Location, Spacing, Turn Lanes, and Medians*. Iowa State Urban Design and Specifications. Available at http://www.iowasudas.org/manuals/design/Chapter05/5L-3.pdf, accessed September 2018.

[4] *Synthesis of the Median U-turn Intersection Treatment, Safety, and Operational Benefits*. Report No. FHWA-HRT-07-033, Federal Highway Administration, McLean, VA, 2007.

[5] *Access Management in the Vicinity of Intersections*. Report No. FHWA-SA-10-002, Federal Highway Administration, McLean, VA, 2010.

[6] *Desktop Reference for Crash Reduction Factors*, Federal Highway Administration, Washington, DC, 2007.

[7] *Safe Access is Good for Business*. Federal Highway Administration Office of Operations – Access Management Primer, 2006.

[8] *Pima County Subdivision and Development Street Standards.* Pima County, Arizona, 2016.

[9] *Sahuarita Town Code – Title 18: Zoning*. Sahuarita, Arizona,

[10] *Access Management Guidelines for Activity Centers*. NCHRP Report 348, Transportation Research Board, 1992.

[11] *Engineering Policy Guide. Sheet 940.9.8 "Right Turn Lane Guidelines for Two-Lane Roadways"*. Missouri Department of Transportation (MoDOT), 2007.

[12] *Engineering Policy Guide. Sheet 940.9.9 "Right Turn Lane Guidelines for Four-Lane Roadways"*. Missouri Department of Transportation (MoDOT), 2007.

[13] *Traffic Impact Analysis. Traffic Engineering Policies, Guides and Procedures*. Arizona Department of Transportation, 2015.

[14] *Trip Generation Manual*. Institute of Transportation Engineers, 10th edition, 2017.

APPENDIX A
ADOT Traffic Engineering Guidelines and Processes
240 – Traffic Impact Analyses

240 TRAFFIC IMPACT ANALYSES

The purpose of this document is to establish uniform guidelines for conducting traffic impact analyses for a proposed new or an expansion of an existing development requesting access or modification of access to the State highway system.

240.1 IMPLEMENTING STATEMENT

ADOT desires to operate a safe and efficient State highway system. The management of access to the system in an effective manner is vital to maintain the overall safety and efficiency of this system. Access to the State highway system is managed through the encroachment permit process. **This permit process requires those desiring access to the State highway system to apply for an encroachment permit. Since access to a State highway for a development may impact traffic on the highway, a Traffic Impact Analysis shall be prepared for developments which desire a permit and meet the specific requirement stated below.**

The purposes of the Traffic Impact Analysis procedures presented herein are to:

- Provide information to the permit applicant and/or their representatives on specific requirements of the analysis, and
- Ensure consistency in the preparation and review of Traffic Impact Analyses.

The procedures outlined herein present the minimum information required when conducting a Traffic Impact Analysis. **The preparer of the Traffic Impact Analysis shall contact the appropriate ADOT Regional Traffic Engineer to discuss the scope of the analysis, methodology, and level of detail required for the specific project prior to beginning the analysis.** See Exhibit 240-A for a pre-submittal form that can be used to compile information for the analysis.

240.2 REFERENCES

American Association of State Highway and Transportation Officials:
- Highway Safety Manual, 2010 Edition
- Highway Safety Manual Supplement, 2014 Edition

Arizona Department of Transportation:
- ADOT TGP 611, "Traffic Signal Needs Studies"
- ADOT Roadway Design Guidelines
- ADOT Access Management Guidelines

Institute of Transportation Engineers:

- Manual of Transportation Engineering Studies, 2nd Edition, 2010
- Trip Generation, 9th Edition, 2012
- Transportation and Land Development, 2002

Transportation Research Board:

- Highway Capacity Manual, 2010 Edition

240.3 DEFINITIONS

Traffic Impact - The effect of site traffic on highway operations and safety.

Traffic Impact Analysis (TIA) - A traffic engineering study which determines the potential traffic impacts of a proposed traffic generator. A complete analysis includes an estimation of future traffic with and without the proposed generator, analysis of the traffic impacts, and recommended roadway changes which may be necessary to accommodate the expected traffic.

Traffic Statement – An abbreviated traffic engineering study which determines the potential traffic impacts of a proposed traffic generator. Analysis is similar to a Traffic Impact Analysis but is typically limited to site driveway concerns. **The Regional Traffic Engineer shall make the final decision on whether a traffic statement may be substituted for a Traffic Impact Analysis.**

Transportation Planning Study - A planning-level traffic study which focuses on roadway capacity and daily traffic volumes rather than peak-hour operations. The study is typically prepared prior to site planning and at the request of local jurisdictions in support of zoning changes.

Traffic Generator - A designated land use (residential, commercial, office, industrial, etc.) or change in land use that generates vehicular and/or pedestrian traffic to and from the site.

Traffic Mitigation - The reduction of traffic impacts on roadways and/or intersections to an acceptable level of service by way of roadway construction improvements, the upgrade of existing traffic control devices, or the modification of the site plan.

Traffic Generation - The estimation of the number of origins from and destinations to a site resulting from the land use activity on that site.

Mode Split - The estimation of the number of trips made by each mode (automobile, pedestrian, bicyclist, transit, etc.)

Trip Distribution - The allocation of the site-generated traffic among all possible approach and departure routes.

Trip Assignment - The assignment of site plus non-site traffic to specific streets and highways.

Influence Area - The geographic area surrounding the site from which the development is likely to draw a high percentage (80% or more) of the total site traffic.

Area of Significant Traffic Impact - The geographic area which includes the facilities significantly impacted by the site traffic.

Peak Hour - The single hour of a representative day when the traffic volume on the highway represents the most critical period for operation and the highest typical capacity requirements.

Peak Hour of Generator - The single hour of highest volume of traffic entering and exiting a site.

Level of Service F - Traffic flow operations that have either broken down (i.e., demand exceeds capacity) or have exceeded a specified service measure value (or combination of service measure values) that most users would consider unsatisfactory.

240.4 REQUIREMENT

A traffic impact analysis shall be required for all new developments or additions to existing developments which generate 100 or more trips during any one hour of a day. The specific analysis requirements and level of detail are determined by the following categories:

(1) Category I - Developments which generate 100 or more peak hour trips but less than 500 trips during the morning or afternoon peak hour of the highway or during the peak hour of the generator.

A Category I Traffic Impact Analysis may also be required for any of the following reasons:

a. The existence of any current traffic problems or concerns in the local area such as an offset intersection, overcapacity of segments or intersections, a high number of crashes, etc., or

b. The sensitivity of the adjacent neighborhoods or other areas where the public may perceive an adverse impact, or

c. Impact on access to a State highway, such as proximity of proposed site driveways to existing driveways or intersections, or

d. Other specific problems or safety concerns that may be negatively impacted by the proposed development.

(2) Category II - Developments which generate more than 500 trips during the morning or afternoon peak hour of the highway or during the peak hour of the generator.

The Regional Traffic Engineer makes the final decision on requiring a Traffic Impact Analysis and the determination whether the Analysis falls within Category I or II. **A developer shall first estimate the number of vehicle trips generated by the development to determine if a Traffic Impact Analysis is required and the applicable category. The developer shall obtain concurrence from the Regional Traffic Engineer on the number and assignment of trips generated by the development.** The developer may ask that the Regional Traffic Engineer assist them in estimating the number of trips for the purpose of determining whether a Traffic Impact Analysis is required for the proposed development.

If a developer agrees to perform mitigation improvements as specified by the Regional Traffic Engineer, preparation of a Traffic Impact Analysis may be waived.

240.5 ANALYSIS APPROACH AND METHODS

The following diagrams illustrate the roadway network accurately and should be included in each Traffic Impact Analysis report, unless specifically waived by the Regional Traffic Engineer:

a. Site location and study area map
b. Site plan
c. Existing peak hour turning volumes
d. Existing transportation system
e. Collision diagram(s)
f. Recommended improvements
g. Anticipated transportation system
h. Estimated site traffic generation (a table may be substituted)
i. Directional distribution of site traffic
j. Site traffic assignment (For each horizon year/Build out)
k. Future traffic assignment without development for each horizon year
l. LOS for future traffic without development for each horizon year
m. Total future traffic, i.e. future traffic with development, for each horizon year
n. LOS for total future traffic for each horizon year
o. Existing number and severity of crashes
p. Predicted or expected number and severity of future crashes without development for each horizon year
q. Predicted or expected number and severity of future crashes with development for each horizon year

For Category I, many of the items may be documented within the text. For Category II, the items should be included in figures and/or tables. **All figures and tables shall be legible.**

Additional diagrams may be required to illustrate development construction phases and proposed alternatives when applicable.

When transportation planning models are used to generate present and/or future traffic conditions, it is the responsibility of the submitter to illustrate the diagrams above to provide a clear, step-by-step analysis.

The traffic analysis approach and methods are presented below.

(1) Study Area

The minimum study area shall be determined by project type and size in accordance with the criteria in Table 240-1. The extent of the study area may be enlarged or decreased depending on special conditions as determined by the Regional Traffic Engineer.

(2) Study Horizon Years

The study horizon years shall be determined by project type and size in accordance with the criteria in Table 240-1.

Table 240-1. Criteria for Determining Study Requirements

Analysis Category	Development Characteristic (c)	Study Horizons (a)	Minimum Study Area On the State Highway(s) (b)
I	Small Development < 500 peak hour trips	1. Opening year 2. 3 years after opening	1. Site access driveways 2. Adjacent signalized intersections and/or major unsignalized street intersections within a minimum of ½ mile.
II a	Moderate, single phase 500 - 1000 peak hour trips	1. Opening year 2. 5 years after opening	1. Site access driveways 2. All State highways, signalized intersections, and/or major unsignalized street intersections within a minimum of 1 mile.
II b	Large, single phase > 1000 peak hour trips	1. Opening year 2. 5 years after opening 3. 10 years after opening	1. Site access driveways 2. All State highways, signalized intersections, and/or major unsignalized street intersections within a minimum of 1 mile.
II c	Moderate or large, multi-phase (d, e)	1. Opening year of each phase 2. 5 years after opening of final phase for developments with < 1000 peak hour trips. 3. 10 years after opening of final phase for developments with > 1000 peak hour trips.	1. Site access driveways 2. All State highways, signalized intersections, and major unsignalized street intersections within a minimum of 1 mile dependent on category.

(a) Assume full occupancy and build-out.

(b) An enlarged study area may be required by the Regional Traffic Engineer for certain projects.

(c) The number of trips shall include all trips made to the site, i.e. pass-by and diverted link trips.

(d) Multi-phase developments shall not exceed 3 phases for purposes of analysis and mitigation.

(e) Multi-phase developments should only be considered if the phases are separated by 2 or more years.

(3) Analysis Time Period

Both the morning and afternoon weekday peak hours shall be analyzed except:

a. If the proposed project is expected to generate no trips or a very low number of trips during either the morning or evening peak periods, then the requirement to analyze one or both of these periods may be waived by the Regional Traffic Engineer, or

b. **Where the peak traffic hour in the study area occurs during a different time period than the normal morning or afternoon peak travel periods (for example midday), or occurs on a weekend, or if the proposed project has unusual peaking characteristics, these additional peak hours shall also be analyzed.**

The peak hour of generation also shall be analyzed where its value exceeds the number of trips generated by the development during the peak hour of the adjacent highway.

(4) Seasonal Adjustments

The traffic volumes for the analysis hours shall be adjusted for the peak season, if appropriate, in cases where seasonal traffic data are available and approved by the Regional Traffic Engineer.

(5) Data Collection Requirements

All data shall be collected in accordance with the latest edition of the Institute of Transportation Engineers "Manual of Transportation Engineering Studies" or as directed by the Regional Traffic Engineer.

a. Turning Movement Counts

Turning movement counts shall be obtained for all existing cross-street intersections to be analyzed during the morning and afternoon peak periods and the peak hour of the generator. Turning movement counts may be required during other periods as directed by the Regional Traffic Engineer. Data should be broken into 15 minute increments in order to determine if any atypical PHF exists.

Available turning movement counts may be extrapolated a maximum of two years with the concurrence of the Regional Traffic Engineer.

b. Daily Traffic Volumes

The current and projected daily traffic volumes shall be presented in the report. Available daily count data may be obtained from ADOT and extrapolated a maximum of two years with the concurrence of the Regional Traffic Engineer.

Traffic volume estimates from other developments within the study area which are expected to occur during the study horizon years should be obtained from ADOT and presented in the report.

Where daily count data are not available, mechanical counts may be required at the Regional Traffic Engineer's discretion.

c. Crash Data

Traffic crash data shall be obtained from ADOT for the most current three-year period available. Requests for crash data by entities outside ADOT should follow the Public Records Request process.

d. Roadway and Intersection Geometrics

Roadway geometric information shall be obtained including roadway width, number of lanes, turning lanes, vertical grade, location of nearby driveways, and lane configuration at intersections.

e. Traffic Control Devices

The location and type of traffic control devices, including signs, markings, signals, and other devices, shall be identified.

(6) Trip Generation

a. **The listed edition of the Institute of Transportation Engineers' "Trip Generation" shall be used for selecting trip generation rates.**

b. Other rates may be used with the prior approval of the Regional Traffic Engineer in cases where the Trip Generation reference does not include trip rates for a specific land use category, or includes only limited data, or where local trip rates have shown to differ from the "Trip Generation" rates.

(7) Trip Distribution and Assignment

a. **Projected trips shall be distributed and added to the projected non-site traffic on the State highway(s).**

b. **The specific assumptions and data sources used in deriving trip distribution and assignment shall be documented in the report.**

(8) Capacity Analysis

a. **Level of service shall be computed for all signalized and unsignalized intersections within the study area in accordance with the listed edition of the Highway Capacity Manual. The level of service shall be calculated and reported by intersection, intersection approach, and lane group within the approach.**

b. **For signalized intersections, operational analyses shall be performed for time horizons up to five years.** The planning method will be acceptable for time horizons beyond five years. Analyses may include modifications to the existing signal timing if the study area is within a coordinated signal system; Highway Capacity Manual signal timing methods should not be used for generating signal timing.

c. Analyses may include an arterial analysis in accordance with the latest edition of the Highway Capacity Manual.

d. **Peak hour factors used for future conditions shall not exceed 0.90. The following peak hour factors shall be used unless otherwise directed by the Regional Traffic Engineer:**

PHF = 0.80 for < 75 vph per lane
PHF = 0.85 for 75 - 300 vph per lane
PHF = 0.90 for > 300 vph per lane

(9) Traffic Signal Needs

a. **A traffic signal needs study shall be conducted for all new proposed signals for the base year.** If the warrants are not met for the base year, they should be evaluated for each year in the study horizon.

b. **Traffic signal needs studies shall be conducted in accordance with ADOT Traffic Engineering Guidelines and Processes 611.**

c. **Existing signals adjacent to the development's access to the State highway shall be evaluated for continued signal**

warrants, phasing, timing, and coordination for each year in the study horizon.

(10) Crash Analysis

An analysis of three years of traffic crash data (and crash prediction, if required) calculations shall be conducted to determine if the level of safety will deteriorate due to the addition of site traffic.

(11) Queuing Analysis

A queuing analysis shall be conducted for all turn lanes, median openings, and ramp termini within the study area. Queuing analysis should be supported by HCM methodologies and represent 95th percentile conditions.

(12) Speed Considerations

Vehicle speed is used to estimate stopping and cross corner sight distances. In general, the posted speed limit is representative of the 85th percentile speed on the highway and may be used to estimate safe stopping and cross corner sight distances. However, the 85th percentile speeds for some highways are commonly higher than the posted speed limit. Therefore, a speed of 5 MPH over the posted speed limit or the 85th percentile speed, as directed by the Regional Traffic Engineer, should be used to estimate stopping and cross corner sight distances for highways with posted speeds of 55 MPH or greater.

(13) Improvement Analysis

The roadways and intersections within the study area shall be analyzed with and without the proposed development to identify any projected impacts in regard to level of service and safety.

a. **Where the roadways, intersections, intersection approaches or lane groups will operate at arterial level of service C or better without the development, the traffic impact of the development on the State highway in the horizon year shall be mitigated to level of service C.** Mitigation to level of service D may be acceptable in urban areas of over 50,000 population at the discretion of the Regional Traffic Engineer and with the concurrence of all affected municipalities.

b. **Where the roadways, intersections, intersection approaches or lane groups will operate below arterial level of service C in the horizon year(s) without the development, the traffic impact of the development shall be mitigated to provide the same level of service at the horizon year(s). If the roadways,**

intersections, intersection approaches or lane groups operate at a level of service of F before the development – mitigation is required to maintain the same degree of level of service F (i.e. same level of delay) which would occur without the development.

(14) Certification

The Traffic Impact Analysis shall be prepared under the supervision of a registered Professional Engineer (Civil). For analyses prepared by persons external to ADOT, the report shall be sealed and signed.

240.6 APPROVALS

The traffic impact analysis shall be submitted to the Regional Traffic Engineer for review and approval.

The Regional Traffic Engineer or their designated representative shall approve or disapprove the Traffic Impact Analysis.

240.7 STUDY AND REPORT FORMAT

(1) Introduction and Summary

a. Purpose of report and study objectives
b. Executive summary
   - Site location and study area
   - Development description
   - Principal findings
   - Conclusions
   - Recommendations

(2) Proposed Development

a. Site location
b. Land use and intensity
c. Site plan (readable version shall be provided)
   - Access geometrics
d. Development phasing and timing

(3) Study Area Conditions

a. Study area
   - Area of significant traffic impact
   - Influence area

b. Land use
  - Existing land use
  - Anticipated future development

c. Site accessibility
  - Existing and future area roadway system

(4) Analysis of Existing Conditions

a. Physical characteristics
  - Roadway characteristics
  - Traffic control devices
  - Transit service
  - Pedestrian/bicycle facilities
  - Existing transportation demand management

b. Traffic volumes
  - Daily, morning, and afternoon peak periods (two hours), and others as required

c. Level of service
  - Morning peak hour, afternoon peak hour, and other as required

d. Safety

e. Data sources

(5) Projected Traffic

a. Site traffic forecasting (each horizon year)
  - Trip generation
  - Mode split
  - Pass-by traffic (if applicable)
  - Trip distribution
  - Trip assignment

b. Non-site traffic forecasting (each horizon year)
  - Projections of non-site traffic by ADOT may be used. For larger developments and study areas, a more comprehensive method may be required which includes: trip generation, trip distribution, modal split, and trip assignment.

c. Total traffic (each horizon year)

(6) Traffic and Improvement Analysis

a. Site access

b. Level of service analysis
  - Without project including programmed improvements (each horizon year)
  - With project including programmed improvements (each horizon year)

c. Roadway improvements
  - Improvements programmed by ADOT or others to accommodate non-site traffic
  - Additional alternative improvements to accommodate site traffic

d. Traffic safety
   - Sight distance
   - Acceleration/deceleration lanes, left-turn lanes
   - Adequacy of location and design of driveway access
   - Crash predictions
e. Pedestrian and bicyclist considerations
f. Speed considerations
g. Traffic control needs
h. Traffic signal needs (base plus each year in five-year horizon)
i. Transportation demand management

(7) Conclusions

(8) Recommendations

a. Site access
b. Roadway improvements
   - Phasing
c. Transportation demand management actions if appropriate
d. Other

(9) Appendices

a. Traffic counts
b. Capacity analyses worksheets
c. Traffic signal needs studies
d. Accident data, analysis, and summaries

240.8 DESIGN REFERENCES

A. **Designs shall be in accordance with or exceed current ADOT Design and Construction standards and guidelines as applicable and appropriate.**

B. **Capacity analyses shall be in accordance with the latest edition of the Highway Capacity Manual.**

C. **Traffic signal needs studies shall be in accordance with ADOT TGP 611.**

Exhibit 240-A. Traffic Impact Analysis Pre-Submittal Form

Project Name:____
Developer/Owner:____
Phone Number: ____
Email:____

Project Location
State Route (with nearest MP or Street):__________________________
Local Jurisdiction:____

Stage of Development (choose one)
☐ Planning/Zoning ☐ Development Plan

Brief Description of Project (land use, intensity, timeframe/phasing)

Proposed Access (number, location, restrictions)

Preliminary Assumptions (provide as attachment)
- Trip Generation
- Study Horizon Years
- Trip Distribution
- Pass-By Or Internal Capture
- Future Roadway Network
- Study Area Intersections

Traffic Study Type (choose one)
☐ Transportation Planning Study
☐ Traffic Impact Analysis
☐ Traffic Impact Statement

Traffic Study Preparer
Firm Name:____
Contact:____
Phone:____
Email:____

Pre-Submittal Forms are not required for each project but are a useful tool to reduce the number of submittals/reviews and aid development timeframes. When submitted, Regional Traffic Engineering staff will review and confirm the form in a timely manner. Changes to the above information should be provided in writing. A hard copy of an approved Pre-Submittal Form shall be included in the Study appendix.

Approval by: ___________________________________ Date:________________